WHAT IS CLAIMED IS:

1. An apparatus for controlling fluid supply to a clutch pack of an automatic transmission of a vehicle having an engine, the apparatus comprising:

a detecting unit for detecting an operating state of a vehicle and abnormal operation thereof;

a control unit for determining if an output of the detecting unit satisfies a pre-fill time control condition and thereby for controlling fluid supply to a clutch pack of an automatic transmission on a basis of a pre-fill time calculated on the basis of output of the detecting unit; and

a fluid supply unit for supplying fluid to the clutch pack under control of the control unit.

2. An apparatus of claim 1, wherein the detecting unit comprises:

an ignition detector for detecting running of an engine;

an engine speed detector for detecting a current engine speed;

a turbine speed detector for detecting a turbine speed of the automatic transmission that is input to a shift mechanism of the transmission;

an output-shaft speed detector for detecting an output-shaft speed of the shift mechanism of the transmission;

a fluid temperature detector for detecting a fluid temperature, the fluid being used for forming pressure of the clutch pack to engage the clutch;

a throttle opening detector for detecting a throttle valve opening; and

a malfunction detector for detecting a malfunction of the vehicle.

3. The apparatus of claim 2, wherein the pre-fill time control condition comprises:

the automatic transmission is in a first speed for the first time after the engine is restarted;

the engine speed is greater than a predetermined engine speed;

the engine speed is greater than a turbine speed;

the output-shaft speed of the shift mechanism is greater than a predetermined output speed;

the throttle valve opening is greater than a predetermined opening;

a difference between fluid temperatures of before the engine is stopped and after the engine is restarted is greater than a predetermined difference; and

a malfunction of the vehicle is not detected.

4. The apparatus of claim 1, wherein the pre-fill time is calculated on the basis of the equations:

$$1st\_Pre\_t_F = (S_C + S_{CL} - S_{CM\_OCP}) \times K_E \times K_{T2} + \Delta t_{F\_Pre};$$ and

$$nxt\_Pre\_t_F = (S_C + S_{CL} - S_{CM}) \times K_E \times K_{T2},$$

wherein:

$1st\_Pre\_t_F$ denotes a first pre-fill time;

$nxt\_Pre\_t_F$ denotes the next pre-fill time that occurs after the first pre-fill time;

S_C denotes a base fill time;

S_{CL} denotes a learned value for the fill time;

S_{CM_OCP} denotes a marginal pre-fill time;

S_{CM} denotes a marginal time for the clutch fill time;

k_E denotes a correction coefficient for engine speed;

k_{T2} denotes a correction coefficient for fluid temperature; and

Δt_{F_Pre} denotes a pre-fill time according to draining of the fluid, the pre-fill time being proportional to a period during which the engine remains stopped.

5. A method for controlling fluid supply to a clutch pack of an automatic transmission of a vehicle having an engine, the method comprising:

detecting an operating state of a vehicle after an engine is restarted;

determining if the operating state satisfies a pre-fill time control condition;

controlling, when the operating state satisfies the pre-fill time control condition, fluid supply to a clutch pack of an automatic transmission on a basis of a pre-fill time calculated on a basis of the operating state;

determining, during the controlling of the fluid supply to the clutch pack, if a pre-fill control release condition is satisfied; and

stopping, when the pre-fill control release condition is satisfied, the controlling of the fluid supply to the clutch pack and performing normal hydraulic control of the

transmission.

6. The method of claim 5, wherein the pre-fill time control condition comprises:

the automatic transmission is in a first speed for the first time after the engine is restarted;

the engine speed is greater than a predetermined engine speed;

the engine speed is greater than a turbine speed;

the output speed of the shift mechanism is greater than a predetermined output speed;

the throttle valve opening is greater than a predetermined opening;

a difference between fluid temperatures of before the engine is stopped and after the engine is restarted is greater than a predetermined difference; and

a malfunction of the vehicle is not detected.

7. The method of claim 6, wherein the pre-fill time is calculated on the basis of the equations:

$$1st\_Pre\_t_F = (S_C + S_{CL} - S_{CM\_OCP}) \times K_E \times K_{T2} + \Delta t_{F\_Pre};$$ and

$$nxt\_Pre\_t_F = (S_C + S_{CL} - S_{CM}) \times K_E \times K_{T2},$$

wherein:

$1st\_Pre\_t_F$ denotes a first pre-fill time;

$nxt\_Pre\_t_F$ denotes the next pre-fill time that occurs after the first pre-fill time;

S_C denotes a base fill time;

S_{CL} denotes a learned value for the fill time;

S_{CM_OCP} denotes a marginal pre-fill time;

S_{CM} denotes a marginal time for the clutch fill time;

k_E denotes a correction coefficient for engine speed;

k_{T2} denotes a correction coefficient for fluid temperature; and

Δt_{F_Pre} denotes a pre-fill time according to draining of the fluid, the pre-fill time being proportional to a period during which the engine remains stopped.